µIO-Stick User Manual

About this document

Scope and purpose

The µIO-Stick is an interface device for controlling Infineon board/kits during run time through PC.

Intended audience

This document is intended for anyone using a µIO-Stick.

Table of contents

1 Acronyms

The following table summarizes the acronyms and their meanings throughout this document.

Table 1 Acronyms

Acronyms	Names
USB	Universal Serial BUs
BSL	BootStrap Loader
CAN	Controller Area Network
GND	Ground
GPIO	General Purpose Input Output
GUI	Graphical User Interface
HID	Human Interface Device
LIN	Local Interconnect Network
MISO	Master Input Slave Output
MOSI	Master Output Slave Input
NAC	No Activity Counter
NVM	Non Volatile Memory
PWM	Pulse Width Modulation
SBC	System Basis Chip
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver Transmitter
VS	Voltage Supply

2 Overview

2.1 Description

The µIO-Stick is an interface device for controlling Infineon boards/kits during run time through PC. It enables the connection between the evaluation board and USB for SPI programming and monitoring. Besides, it plugs into the evaluation board via a standard 16-pin connector and allows easy interface to the microcontroller via USB for communication through UART, SPI, LIN. It also implements GPIO ports, PWM generation up to 20 kHz and an analog measurement interface (ADC).

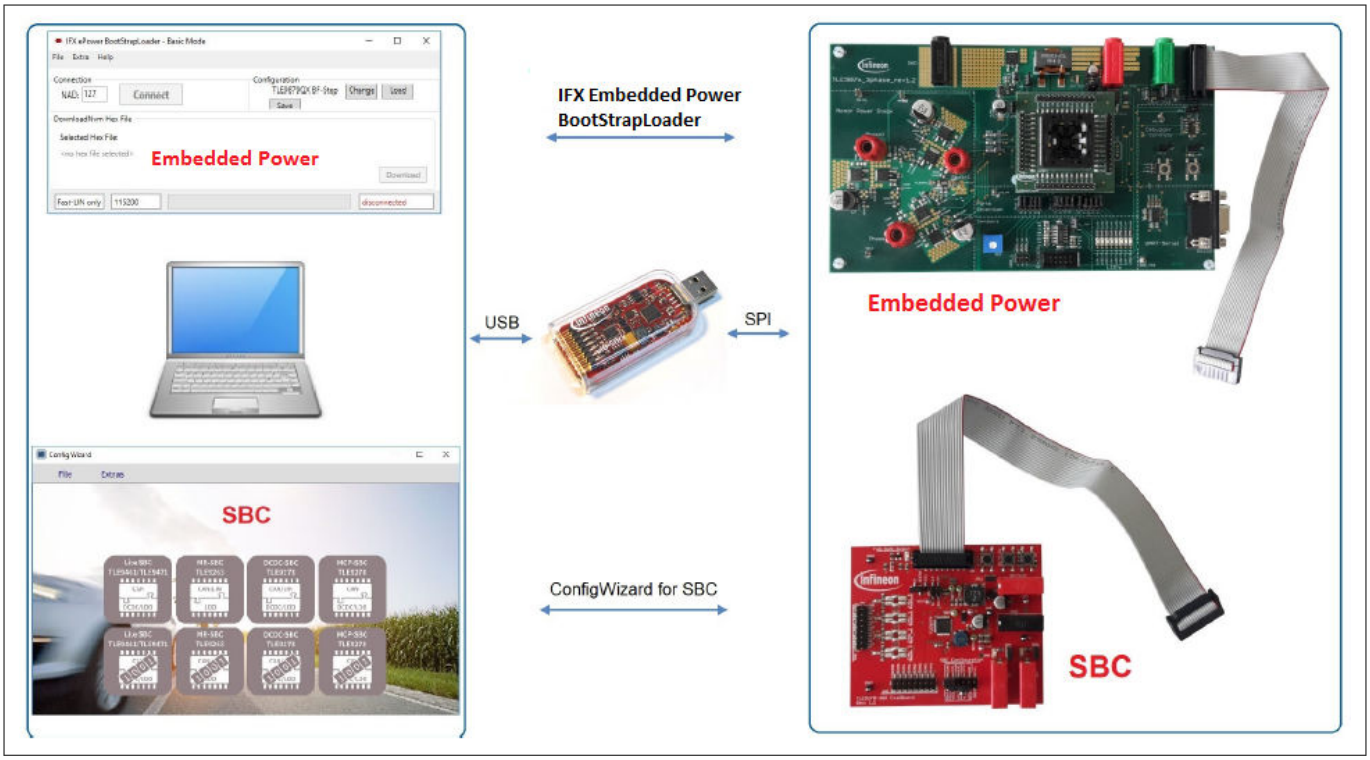

Figure 1 µIO-Stick Overview

The µIO-Stick provide two exclusive functions:

1. **Infineon Embedded Power Fast LIN BSL Support**

   The Infineon Embedded Power devices provide a built-in boot strap loader (BSL), for programming the embedded power devices over the built-in LIN transceiver or UART. The µIO-Stick acts as an interface between the embedded power device and a PC. It handles the BSL protocols as well as the physical layers. A PC application provides access to all BSL functions of the Embedded Power device.

   Supported Embedded Power ICs:

   - TLE984x family
   - TLE986x family
   - TLE987x family

2. **Run-Time Control - Programming and Monitoring**

   The µIO-Stick connects the Evaluation Board with the computer. Via the ConfigWizard software – a powerful and intuitive Graphical User Interface (GUI) – the user gets a customized programming, monitoring and evaluation support for various Infineon Automotive Products.

   Supported Devices:

   - ***System Basis Chip (SBC)***

2 Overview

- ***High/low Side Switch (Spider+, SPOC)***
- ***Half and Full Bridge Driver***

2.2 Key Features

The µIO-Stick provides the following features:

- Communication with the connected device via LIN, SPI and UART
- Four GPIOs
- PWM signal generation up to 20 kHz
- Measurement of analog voltages up to 20 V
- Read and keep functionality to detect reset of the connected device
- USB HID device, no additional driver installation required
- µIO-Stick can power a target device
- Connected device can also be powered by external power supply for higher current
- 3 on-board status LEDs
- Additional BSL updater GUI for BSL communication with Embedded Power devices

2.3 Block Diagram

The µIO-Stick consists of an XMC4200 micro-controller which provides the necessary hardware interface and handles the USB and BSL protocols.

LIN and RS232 are implemented as true physical layers (using LIN and MAX transceivers), while the digital lines (SPI, GPIOs) provide a 5V-TTL level.

In addition, a small switchable charge-pump is implemented to generate a +12 V/200 mA supply for the target device and the integrated LIN transceiver.

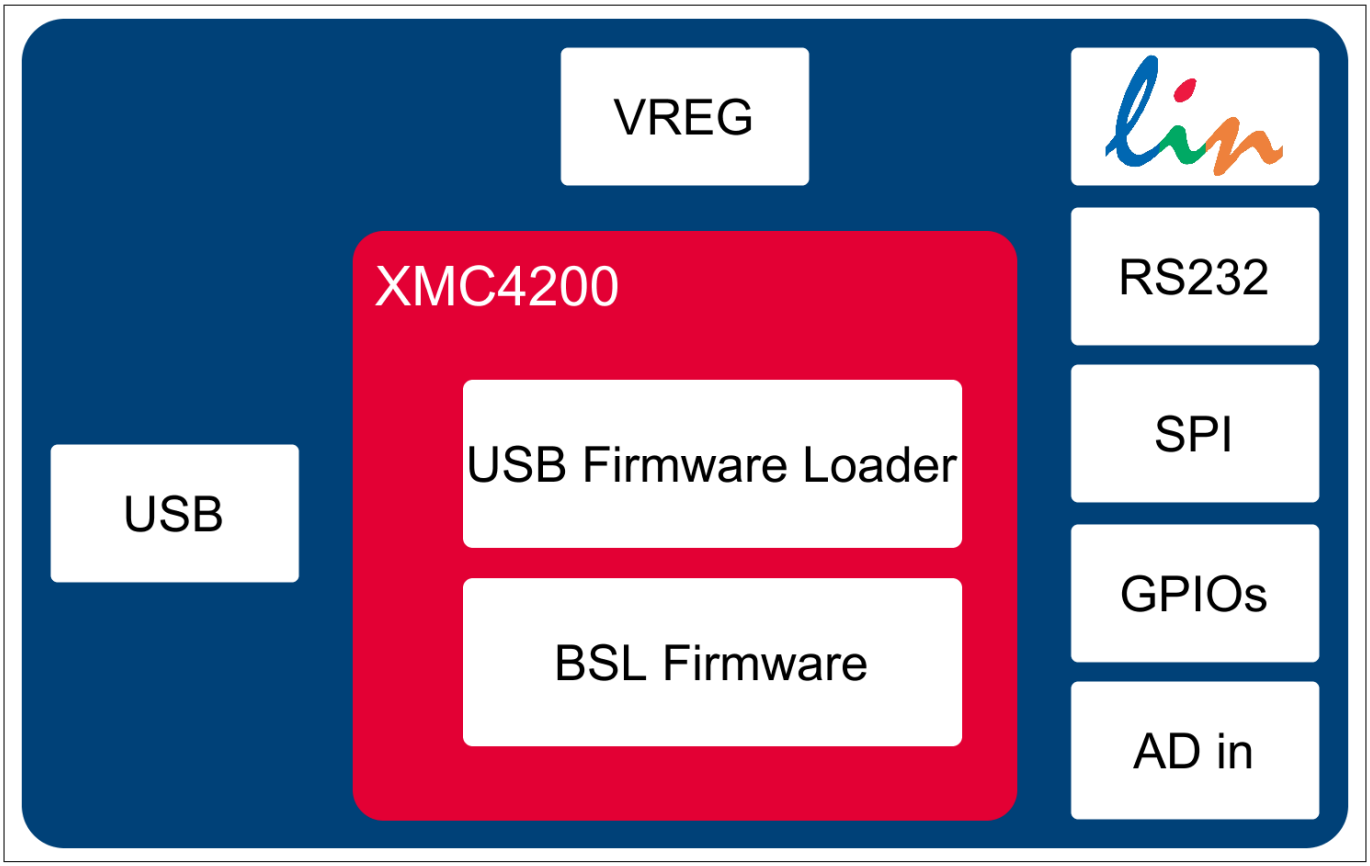

Figure 2 µIO-Stick Block Diagram

3 Hardware Connection

3.1 Pin Assignment

The µIO provides two interfaces, the USB interface to be plugged into the PC, and a 16-pin header to access the BSL interface. ***Figure 3*** provides a view into the 16-pin header of the µIO-Stick, including the pin numbering.

Figure 3 µIO-Stick Pin View

Table 2 lists the pin usage of the 16-pin header. The gray shaded pins are not used for BSL functions and therefore will not be considered further.

Table 2 µIO-Stick Pin Assignment

PIN	Description
1	RS232-TxD (out)
2	GND
3	RS232-RxD (in)
4	+5 V (USB, out)
5	LIN (physical, in/out)
6	VS (target supply, in/out)
7	Target Reset (5 V, out)
8	GPIO3 (5 V, in/out)

Table 2 µIO-Stick Pin Assignment (continued)

PIN	Description
9	SPI/CS(5 V, out)
10	GPIO2 (5 V, in/out)
11	SPI CLK (5 V, out)
12	GPIO1 (5 V, in/out)
13	SPI MISO (5 V, in)
14	GPIO0 (5 V, in/out)
15	SPI MOSI (5 V, out)
16	analog in (max. 18 V)

Pins 1, 3 - RS232 They are used for UART BSL communication and need to be connected to the corresponding RS232 inputs of the target board.

Attention**: **The RS232 pins are no TTL pins but real RS232 levels (MAX232 driven).

Pin 5 - LIN This is the LIN bus connection to the LIN transceiver implemented in the µIO- Stick, it is suited to drive a corresponding LIN input of the target system.

Pin 7 - Target Reset This pin is intended to drive the reset input of the target device in order to synchronize the device state with the attempts to establish a BSL connection. The connection of this pin to the reset of the target device is not necessarily required, as synchronization can also be achieved by:

- power cycling of the target device by Pin 6 (VS)
- keeping the target device in BSL mode by configuring an appropriate NAC value

Pin 2 - GND This is the common ground connection to the target system.

Pin 6 - VS This pin can either be driven from the implemented charge-pump of the µIO-Stick (+12 V/200 mA) or can be overridden by an external supply, i.e. the supply of the target device. This pin is also being used to internally drive the LIN transceiver available on the µIO-Stick. If BSL communication over the LIN interface is intended, then the supply of Pin 6 is mandatory.

3.2 Examples

Figure 4 shows the minimum required connection from the µIO-Stick to the target device in order to establish a BSL communication over the LIN interface. This applies to both Normal-LIN and FastLIN protocols. To be able to establish a BSL connection, the target device either has to stay in BSL mode upon power up (fresh device), or a power cycling (VS - Pin 6) done by the µIO-Stick would be required.

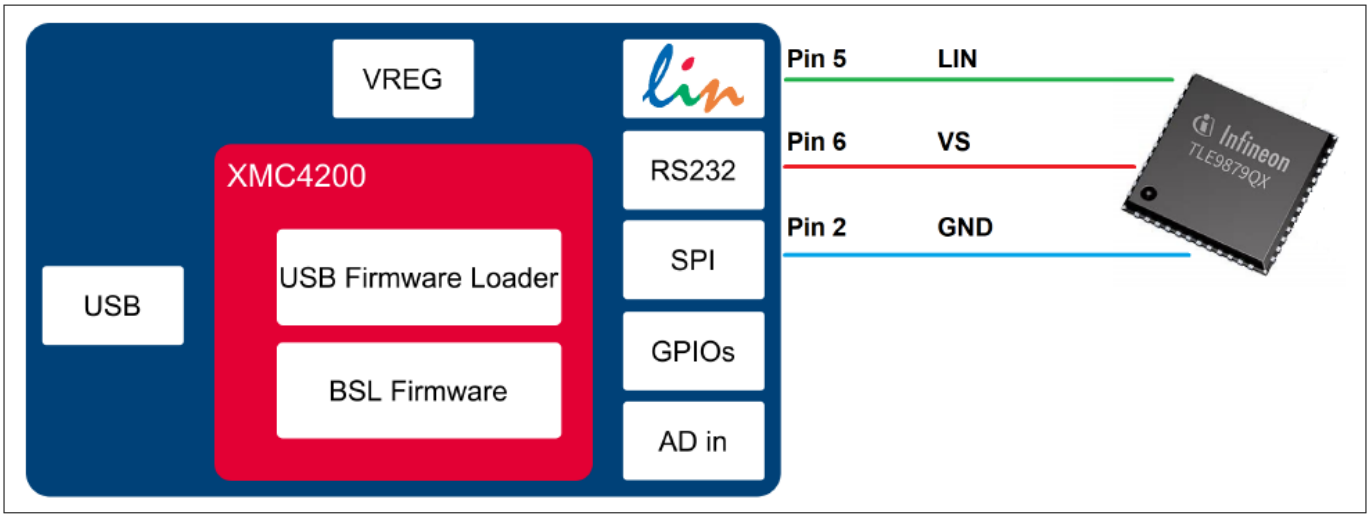

Figure 4 Normal LIN and FastLIN connection, without reset, target supplied by µIO

Figure 5 shows a connection scenario with reset. The µIO-Stick actively resets the target device in order to start BSL communication. In this case a power cycling of the VS (Pin 6) by the µIO-Stick would not be required.

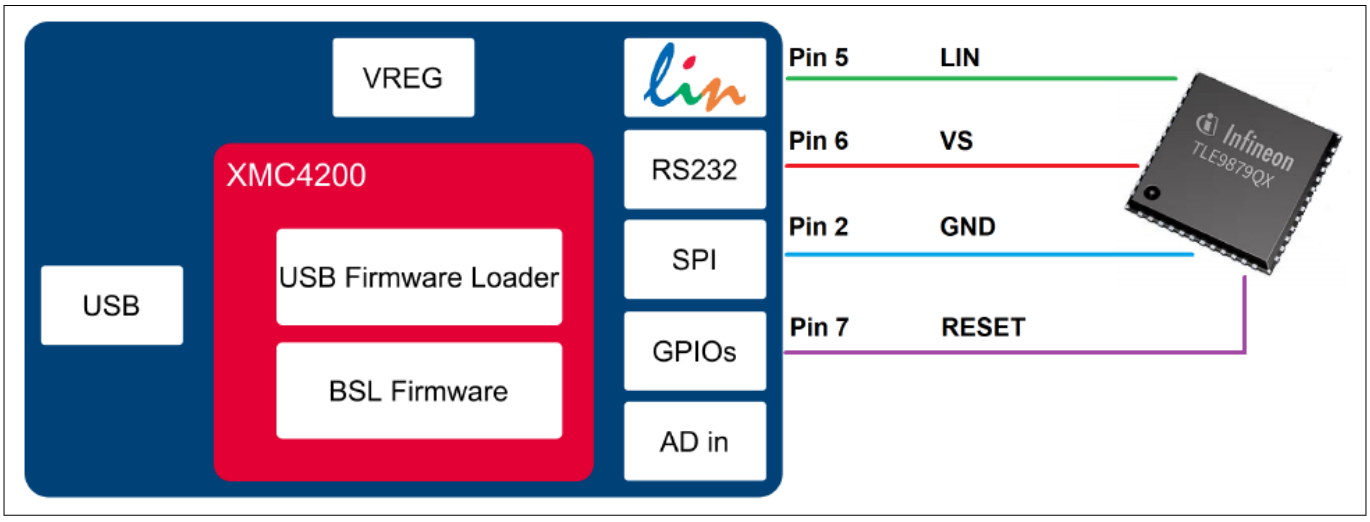

Figure 5 Normal LIN and FastLIN connection, with reset, target supplied by µIO

3 Hardware Connection

Figure 6 shows a connection example where the target device and also the µIO-Stick is supplied by an separate power supply. Since in this case the µIO-Stick would not be able to perform a VS power cycling to restart the device it is wise to connect the reset line as well. If the target device stays in BSL mode upon power-up, such as for a new, unprogrammed device then the reset line is not required.

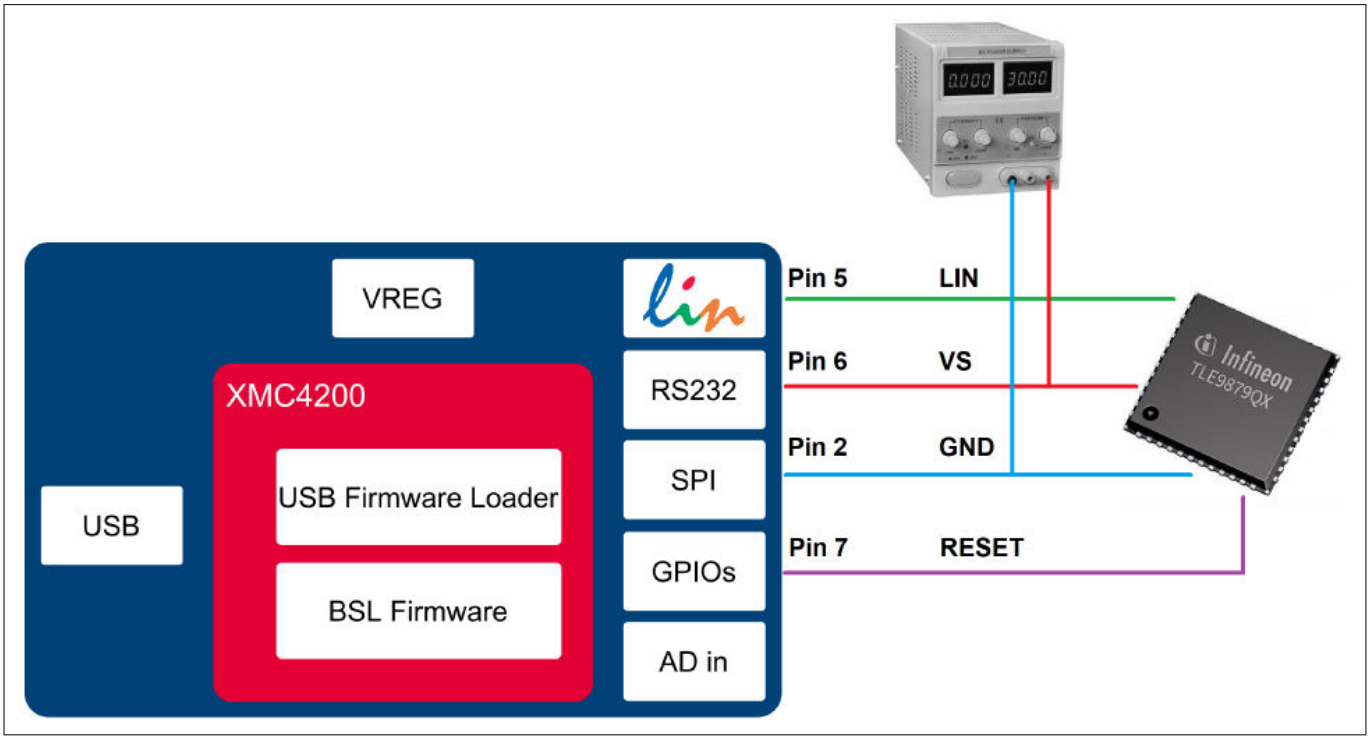

Figure 6 **Normal LIN and FastLIN connection, with reset, target supplied by separate power supply**

3 Hardware Connection

Figure 7 shows another example of how to connect the µIO-Stick to the target device, by simply plugging the ribbon cable to the BSL-connector of the evaluation board. Hereby all interfaces (LIN and UART) are supported.

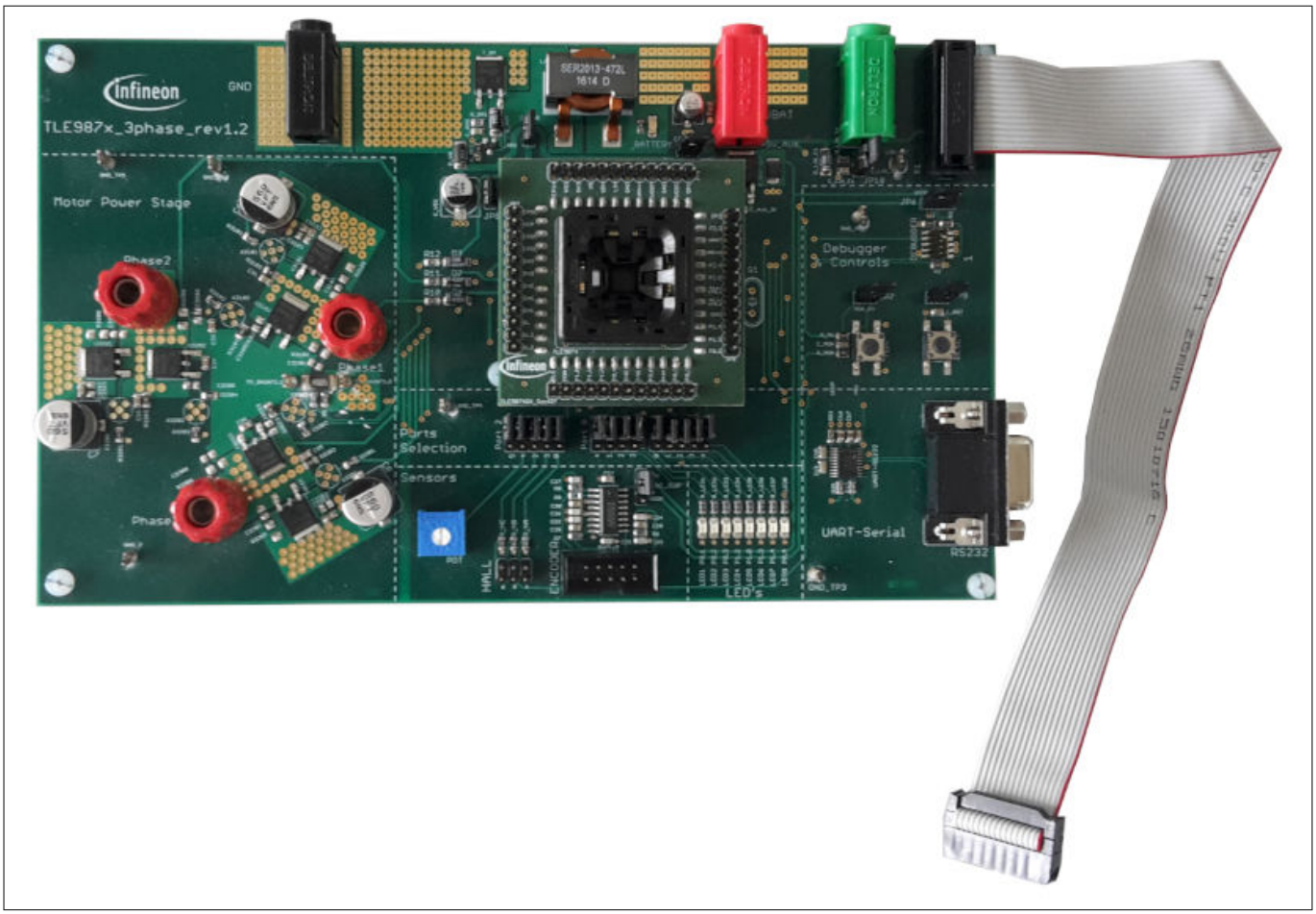

Figure 7 Direct connection of µIO-Stick to evaluation board, LIN-, FastLIN- and UART-BSL

4 µIO-Stick Firmware Update

The µIO Stick comes with the capability to update the firmware of the integrated XMC4200 micro-controller either to provide new features to the customer, or to be able to correct issues with the firmware.

To update the firmware, the file uIO-Updater.exe and a HEX file is required. uIO-Updater.exe is a command line tool, where the hex file to be loaded has to be given as command line input. For example:

```
C:\>uIO-Updater.exe -FW="bsl_1.1.346.fw"
```

The example above flashes the "BSL_V1.1.346.hex" file into the µIO-Stick. After the firmware update has finished, please unplug the µIO-Stick from USB and reconnect it.

5 Fast LIN BSL Support

There are two software components required to use the BSL feature of the target device. Part 1 is the firmware of the XMC4200 microcontroller mounted on the µIO-Stick. This firmware is responsible to generate the BSL communication protocol. Part 2 is the BSL user software running on a Microsoft® Windows® PC. It provides the user interface and prepares the data packets to be sent to the µIO-Stick and further to the target device.

5.1 Installation Guideline

1. Go to the section ***Tools & Software*** of the µIO-Stick
2. Download **uIO_BSL_Tool.zip** and extract all the files
3. Connect the µIO-Stick via USB to the PC and via the 16-pin connector to the target device
4. Update the µIO-Stick with the current BSL firmware version by executing the script **UpdateBSL**
5. Launch the application **BSL_Tool.exe**

5.2 BSL Tool

The BSL GUI tool is the user interface to control the BSL interactively. It provides two modes of operation, a Basic Mode and an Expert Mode.

5.2.1 Basic Mode

The Basic Mode provides a reduced user interface limited to the minimum required actions, such as download of code into the target device.

Figure 8 shows the user interface of the Basic Mode.

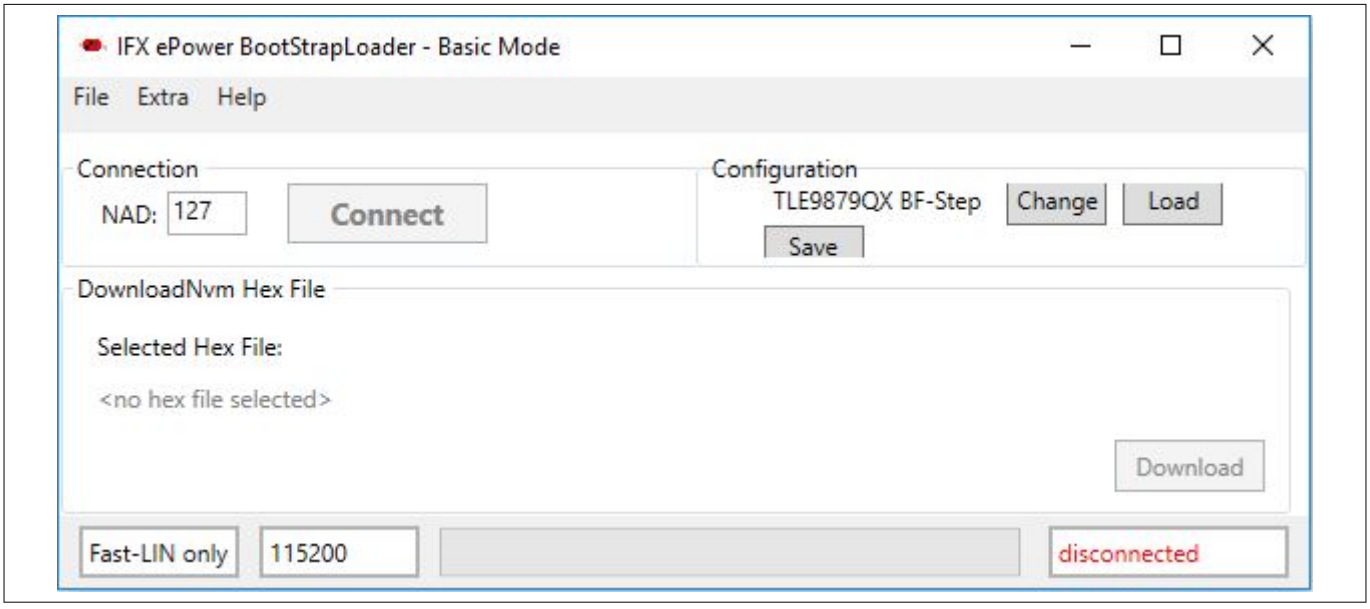

Figure 8 BSL Tool - Basic Mode

5.2.2 Expert Mode

The Expert Mode provides much more functionality, all functions of the BSL modes supported by the target device are available in this mode. In order to switch to Expert Mode from Basic Mode, select the Expert Mode in the Extra menu, as shown in ***Figure 9*** on page 14 .

5 Fast LIN BSL Support

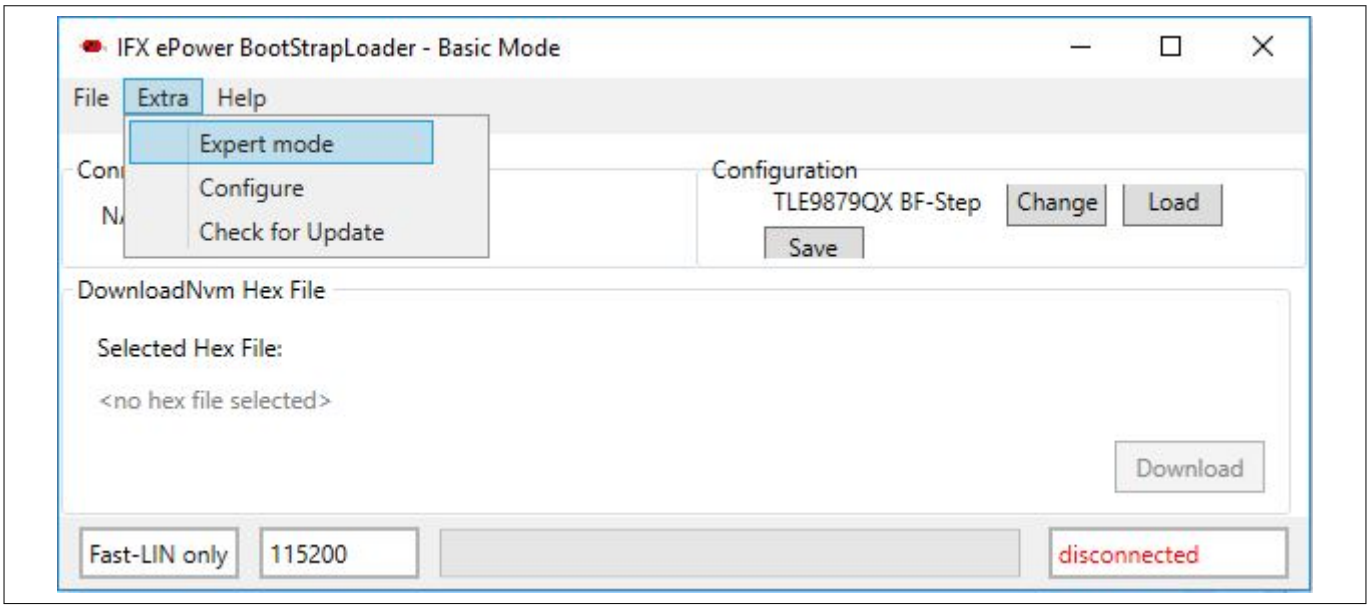

Figure 9 BSL Tool - Select Expert Mode

Figure 10 on page 15 displays the user interface of the Expert Mode. The Expert Mode enables all possible BSL actions, including target device erase, code download, device protection, code execution, and code upload. The arrangement of these functions in the GUI is kept in the natural order of execution of these actions, i.e. erase function at the top, followed by download, verify, etc..

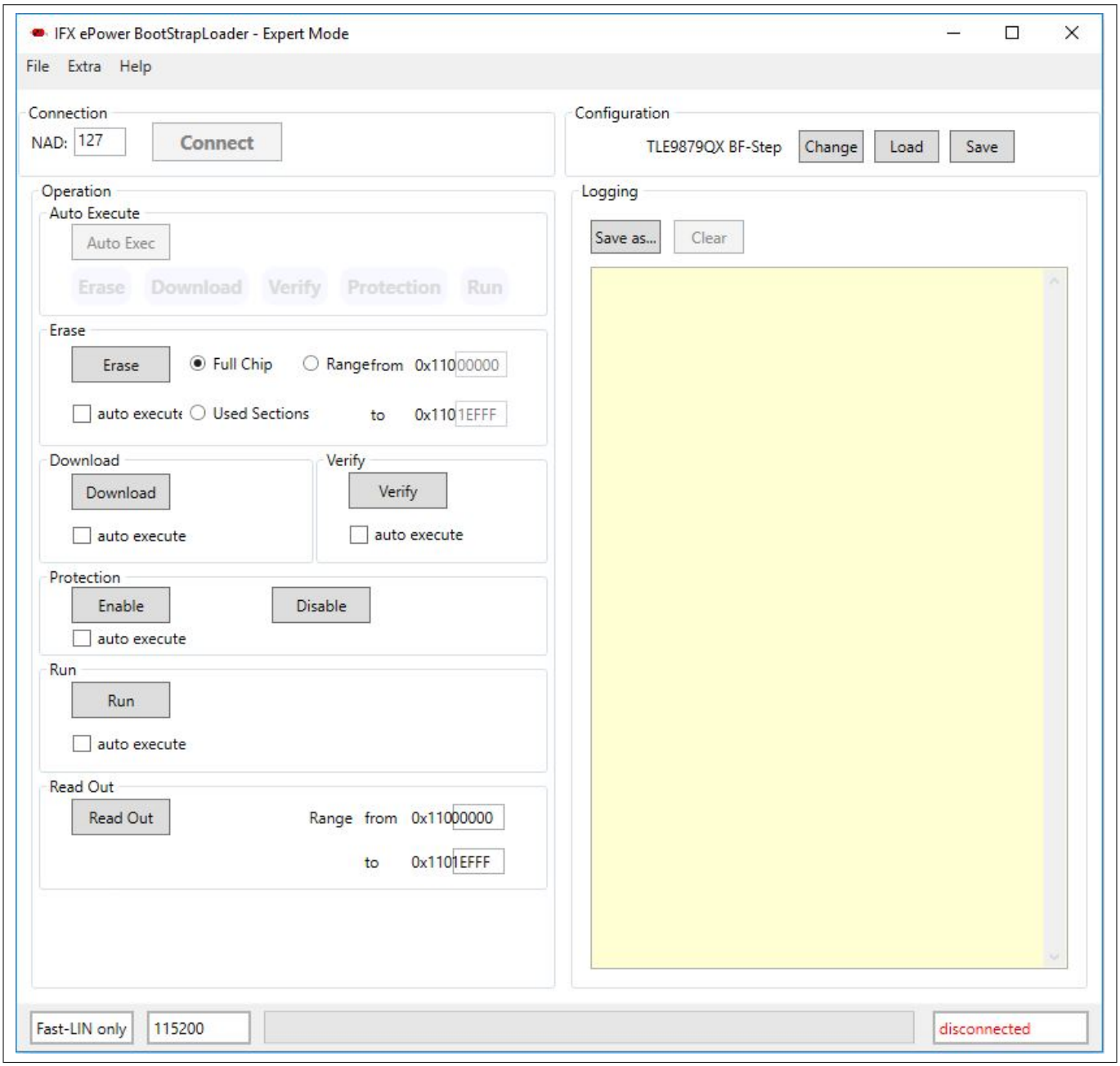

Figure 10 BSL Tool - Expert Mode

5.2.3 Configuration Dialog Box

Before a BSL connection is established, the target device and the BSL interface and protocol have to be selected. The Configuration block lists the currently selected target device, while the status bar at the bottom of the window displays the selected BSL interface/protocol and baud rate. In order to change these settings, press the Change button inside the Configuration block. Please also refer to ***Figure 11*** on page 16.

5 Fast LIN BSL Support

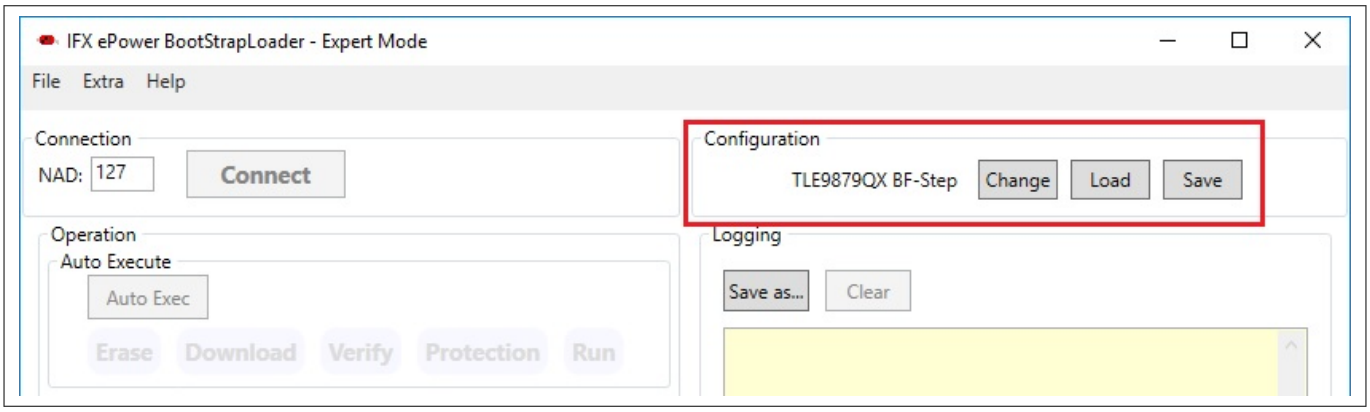

Figure 11 BSL Tool - Configuration Button

Figure 12 displays the Configuration dialog. Here, the user selects the desired target device, BSL protocol, baud rate, and the behavior of the integrated VS charge pump.

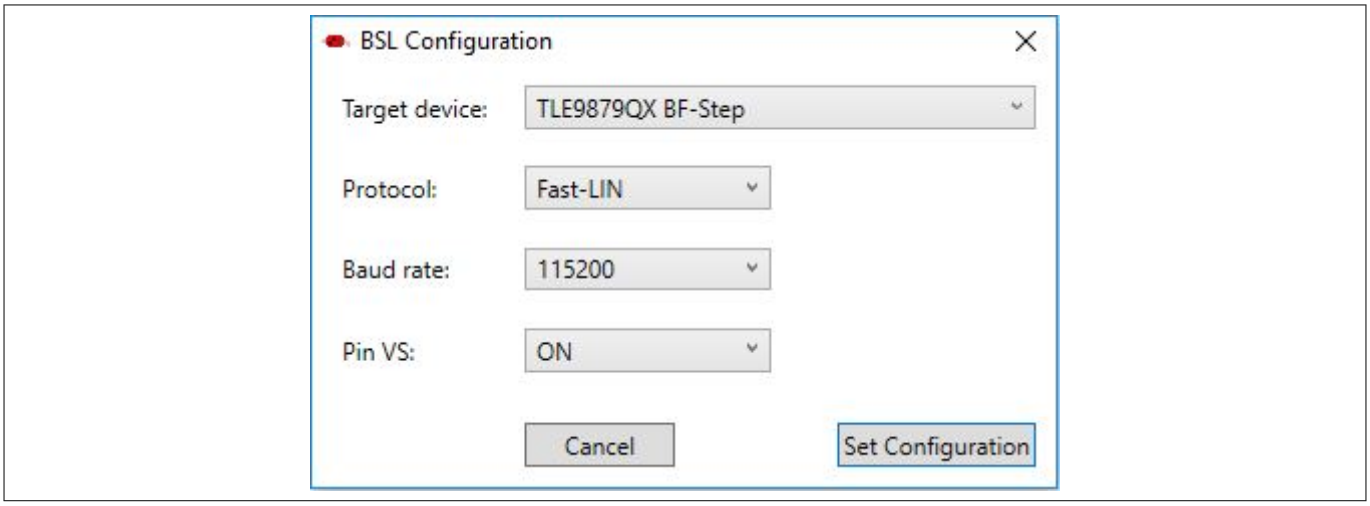

Figure 12 BSL Tool - Configuration

- Target Device - select the target device from the pull-down list.
- Protocol - select the desired BSL protocol and BSL interface:
  - Normal LIN - BSL communication uses real LIN frames, Master-Request frames, and Slave-Response frames. In order to distinguish these BSL LIN frames from real LIN frames, the checksum is inverted. Communication is via the target device integrated LIN transceiver.
  - Fast-LIN - UART like BSL communication using the device integrated LIN transceiver. This is the default protocol for new, unprogrammed devices.
  - UART - full-duplex UART communication over UART1 of the target device.
- Baud Rate - selects the communication baud rate.
- Pin VS - selects the usage/behavior of the VS pin (Pin 6):
  - Off - the µIO-Stick integrated charge pump is switched off, VS must be supplied by the target system, see also *Figure 6* on page 10.
  - On - the µIO-Stick integrated charge pump is switched on, and remains on. Please see also *Figure 5* on page 9.
  - Off during Reset - the µIO-Stick integrated charge pump is switched off during the reset phase before the connection attempt is started, see also *Figure 4* on page 9.

5.2.4 Establish a Connection

Once the configuration has been completed, the connection to the target device can be established. If the µIO-Stick is not connected to the PC system, the Connect button is shaded gray, as shown ***Figure 13***.

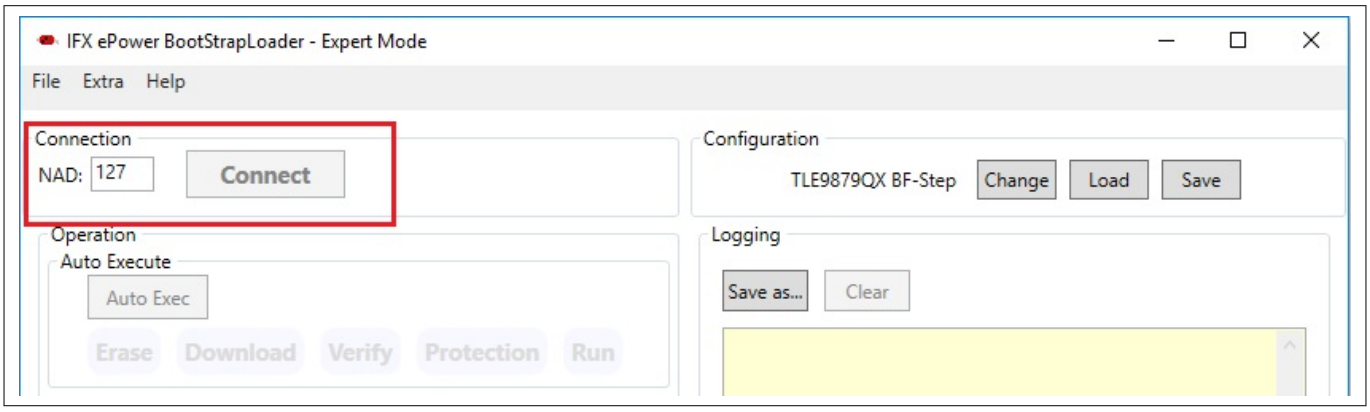

Figure 13 BSL Tool - No µIO-Stick found

Once the µIO-Stick is recognized, by the BSL tool the connect button turns orange. By pressing the Connect button, the BSL tool tries to establish a connection using the selected BSL interface and BSL protocol.

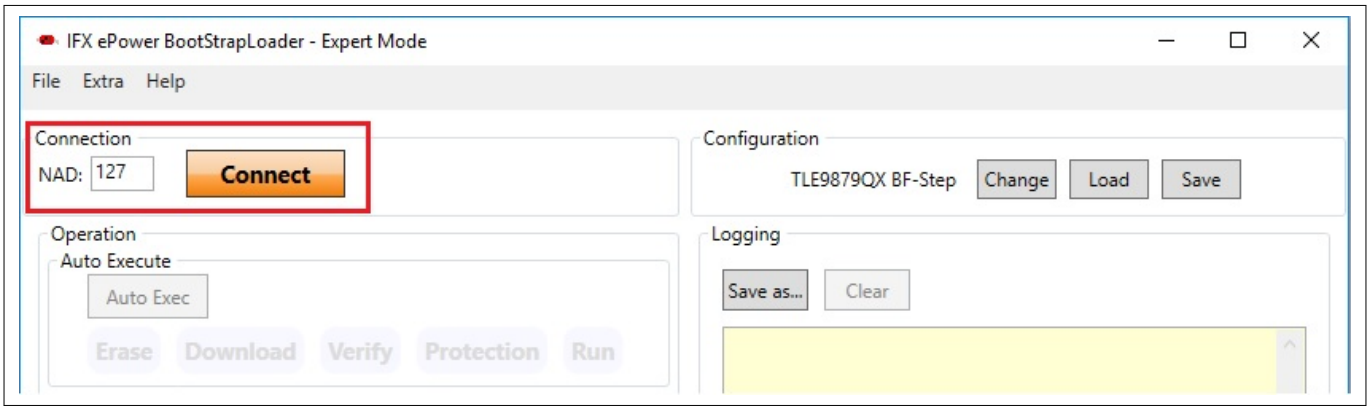

Figure 14 BSL Tool - Ready to connect to target system

Figure 15 on page 18 displays the connected state, the logging window states that the BSL communication has been established, and the status bar at the bottom of the window shows “connected”.

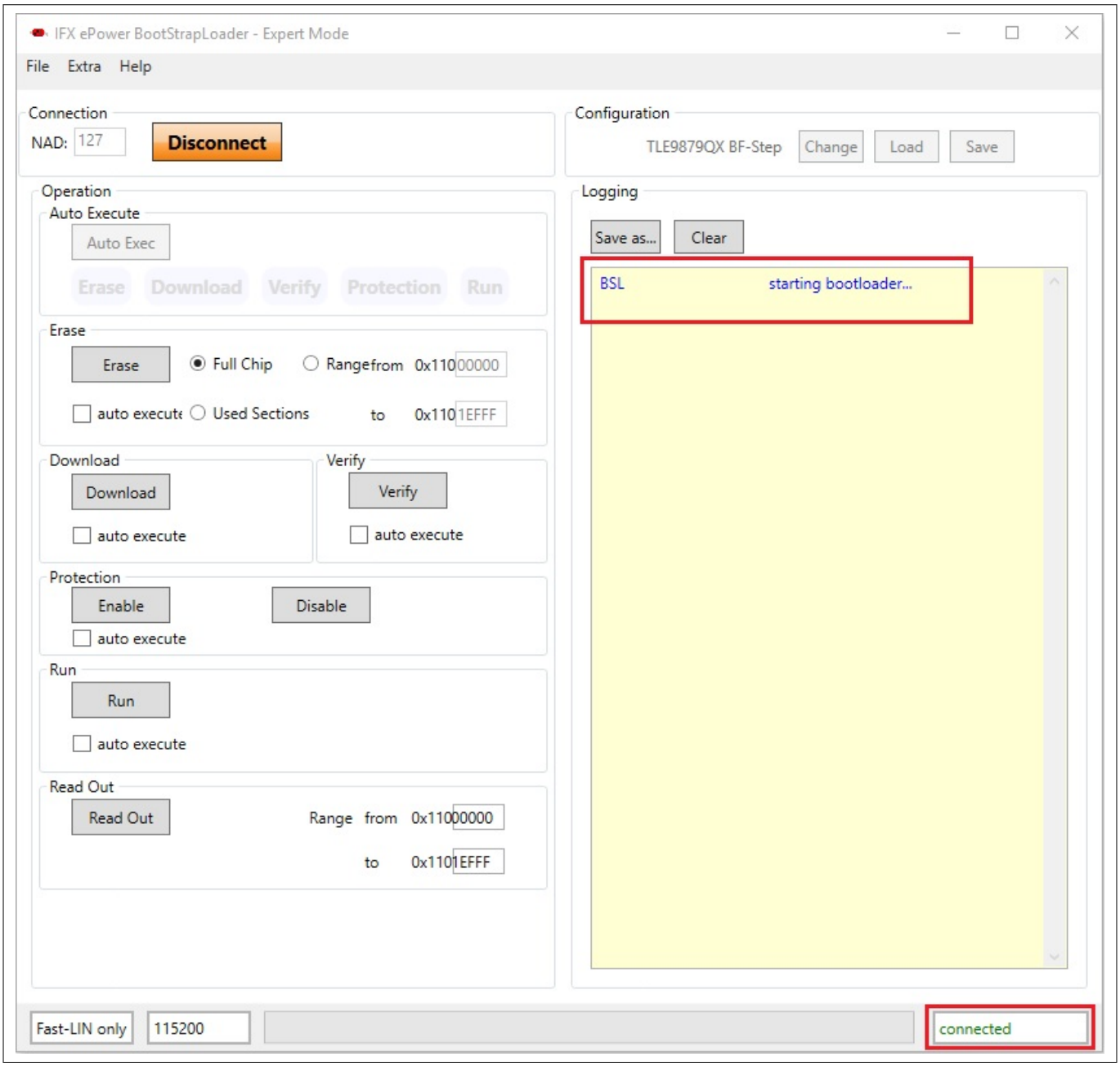

Figure 15 BSL Tool - Connected

5.2.5 Loading a HEX File

The main use of the BSL tool will be the downloading of a HEX file, containing the user application code. Via the File menu, a HEX file can be chosen and loaded, see ***Figure 16*** on page 19.

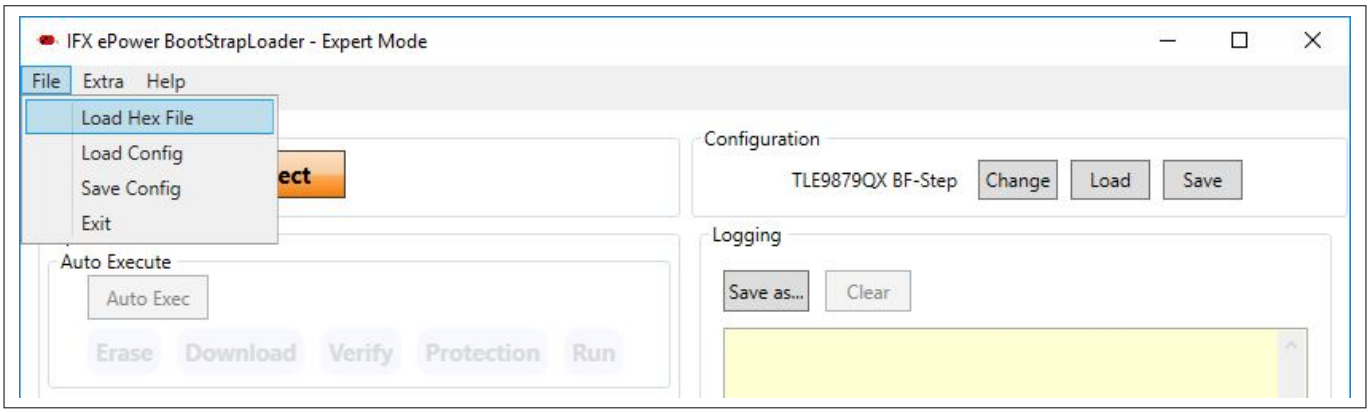

Figure 16 BSL Tool - Loading a HEX file

5.2.6 BSL Actions

Once the desired Hex file has been selected, the supported BSL actions can now be executed. The order of the actions placed on the GUI follows a natural flow: Erase -> Download/Verify -> Protection -> Run.

5.2.6.1 Auto-Execute

Each of these action groups provides an “auto execute” check box. If it is checked, the corresponding action is added to the “Auto Execute” list. ***Figure 17*** on page 20 shows an example of the “Auto Execute” list, where everything except Protection is added to the list. By pressing the “Auto Exec” button, the actions added to the list are executed with a single click.

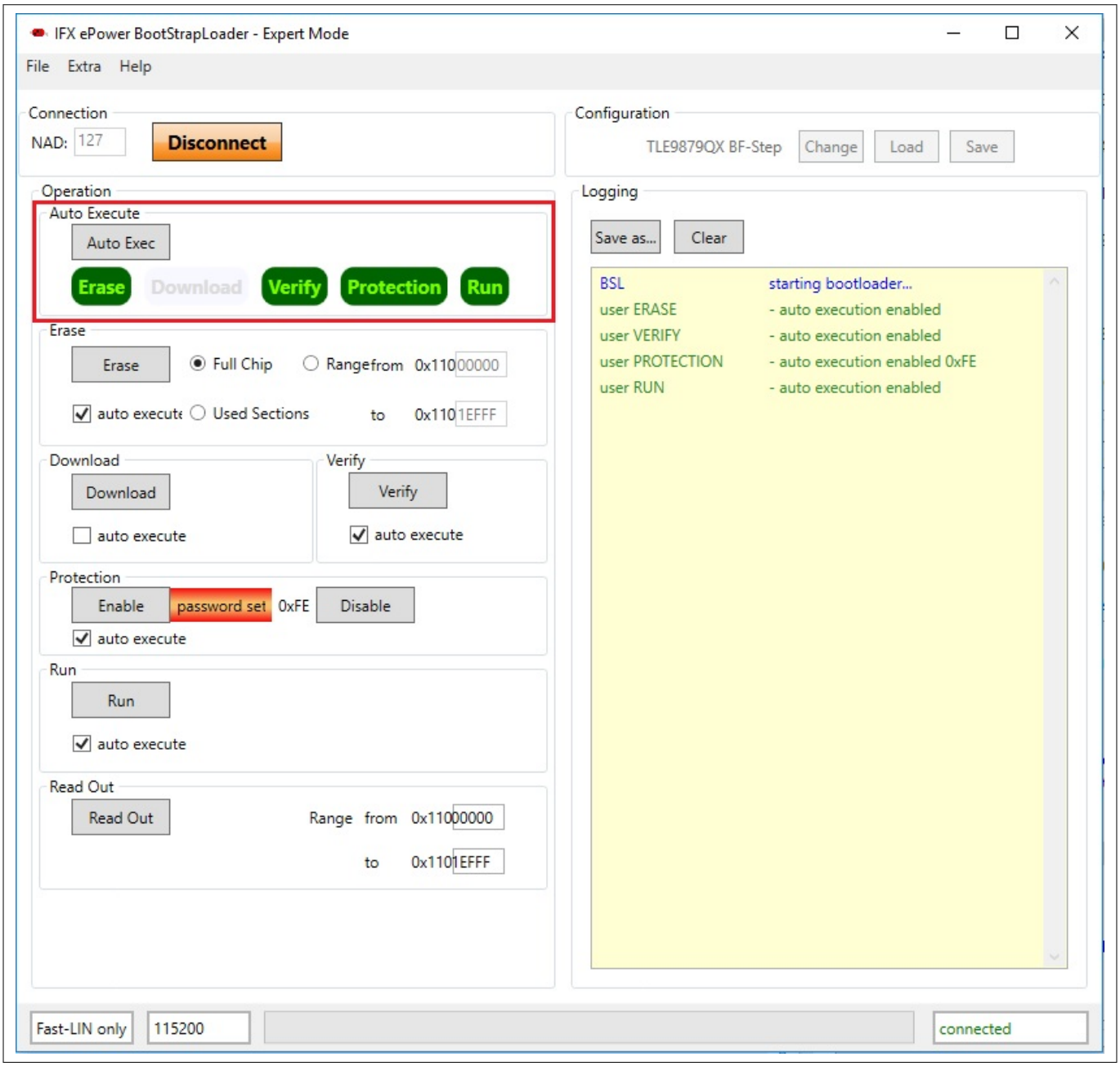

Figure 17 BSL Tool - Auto Execute

5.2.6.2 Erase

The action **Erase** erases the built-in NVM module of the target device. The user can select between various sections of the NVM to be erased, which are:

- Full Chip - the entire user accessible NVM will be erased.
- Range from ... to ... - only the user defined range will be erased.
- Used Sections - only those NVM regions occupied by the selected HEX file will be erased.

5.2.6.3 Download

The action **Download** transfers a loaded HEX file into the target device.

5.2.6.4 Verify

The action **Verify** is used to check the integrity of the code inside the target device NVM against the selected HEX file.

5.2.6.5 Protection Enable/Disable

The action **Protection** either sets the protection of the target device, or resets it. In both cases, a password dialog opens up, the user has to enter an 8-bit password. See ***Figure 18***.

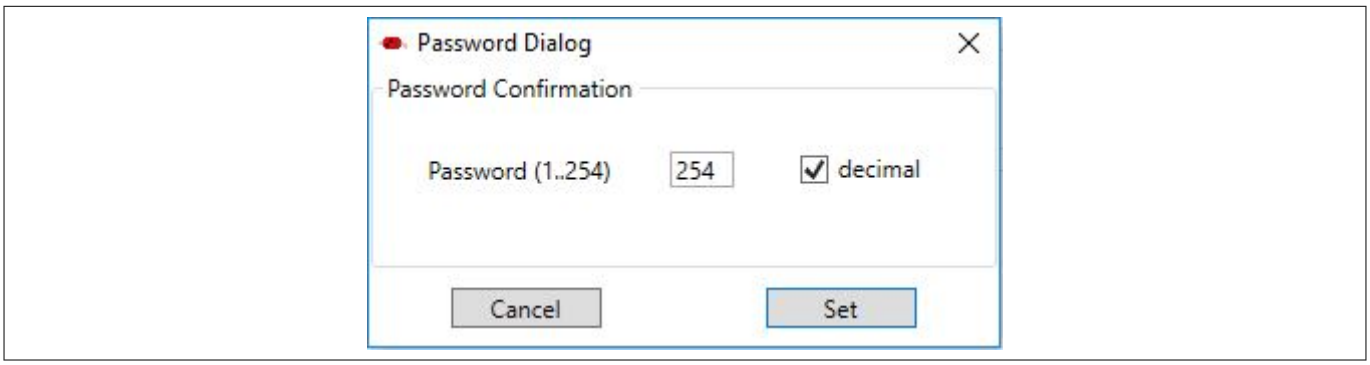

Figure 18 BSL Tool - Password Dialog

If the Protection is set, the target device does no longer accept any NVM change operations, nor allow code readout. In addition, the SWD interface (ARM) or the DAP interface (8051) is disabled.

To reset the Protection status, the same matching 8-bit password used to set the protection has to be provided in the Password Dialog. If the password matches, the entire NVM of the target device is erased and the target device is fully accessible again.

If the “Auto Execute” feature is being used for the Protection Action, then the Password dialog opens to be able to define the password used for the “Auto Execution” flow.

5.2.6.6 Run

The action **Run** starts the execution of the code inside the target device. The BSL connection is terminated by this action.

5.2.6.7 Read Out

The action **Read Out** is only available for the protocols “Fast-LIN” or “UART”, it is not available for “Normal LIN”. It reads and transfers the target device NVM content to the PC system. The user has to define the address range to be read.

5.3 Command Line Tool

In order to run the BSL actions none-interactively, a command line BSL tool is provided. It is named **BSL_Cmd.exe**, and should be run from a terminal window. Executing BSL_Cmd.exe without any parameters generates a list of the supported options, as shown below:

```
C:\>BSL_Cmd.exe
-------------------------------------------------------
Bootstrap Loader Command Line Tool v1.2 build 638
-------------------------------------------------------
ERROR          : missing arguments
Valid commands are:

-Cmode=baud,NAD          connection mode and baud rate
-EF                      erase full chip
-ER=start-end            erase range
-D="hex_file"            download hex file (repeatable)
-VS=n                    function of VS pin. 0: off, 1:on, 2:off during reset
-V=1                     verify after download
-PS=password             set protection
-PR=password             reset protection
-R100TP=page,"hex_file"  read the selected 100TP page and save it
-RO="hex_file",start-end  read out range into hex
-R=NVM                   run in NVM
-R=RAM                   run in RAM
-T=device                target device
-NACNAD=nac,nad,bslMode  set NAC, NAD and BSL mode (F:fastLIN, L:LIN)
-W100TP=page,"hex_file"  write hex file to selected 100TP page
-Q                       quite mode

mode           : N/F/FO/U  N=Normal LIN, F=Fast-LIN, FO=Fast-LIN-only, U=UART
baud           : baud rate 9600..115200
hex_file       : defines the hex file for the download
page           : selects 100TP page (1..8)
start          : defines the start address for the operation
end            : defines the end address for the operation
device         : defines the target device (s. TargetConfiguration.xml)

-------------------------------------------------------------------------------
```

The code above shows a call of BSL_Cmd.exe with various options, which are:

- -CFO=115200,1 : Fast-LIN-only, 115200 baud, NAD = 1
- -T=TLE9879QX : target device TLE9879QX, it has to match the device select list in the Configuration Dialog
- -VS=1 : VS (Pin 6) on all the time
- -EF : Erase full chip
- -D=”Blinky.hex” : downloads the Blinky.hex file to the target device
- -PS=0x55 : sets protection with the 8-bit password 0x55

6 Run-Time Control - Programming and Monitoring

6.1 Installation Guideline

1. Download and install the ***Infineon Toolbox***
2. Select the tab "Manage tools", search for SBC, and click "Install"

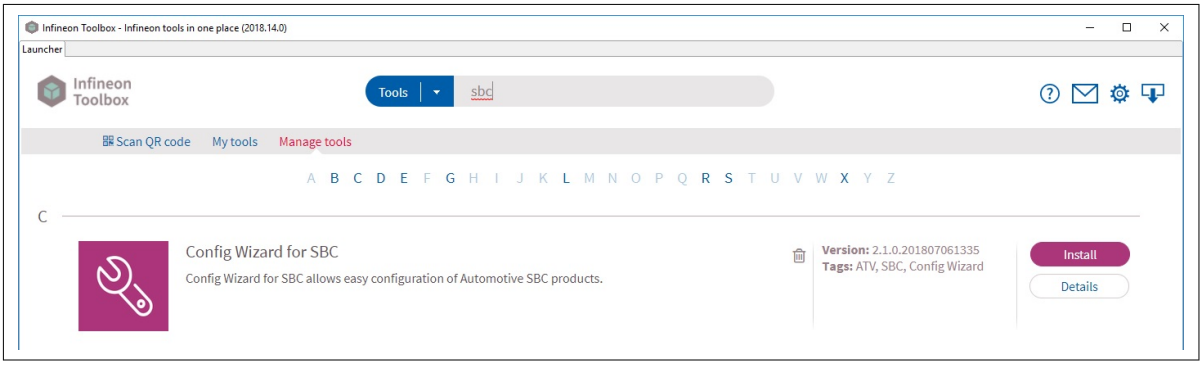

Figure 19 Installation of Config Wizard for SBC

3. Select the tab "My tools". If the installation was successful, you should see the icon for "Config Wizard for SBC"

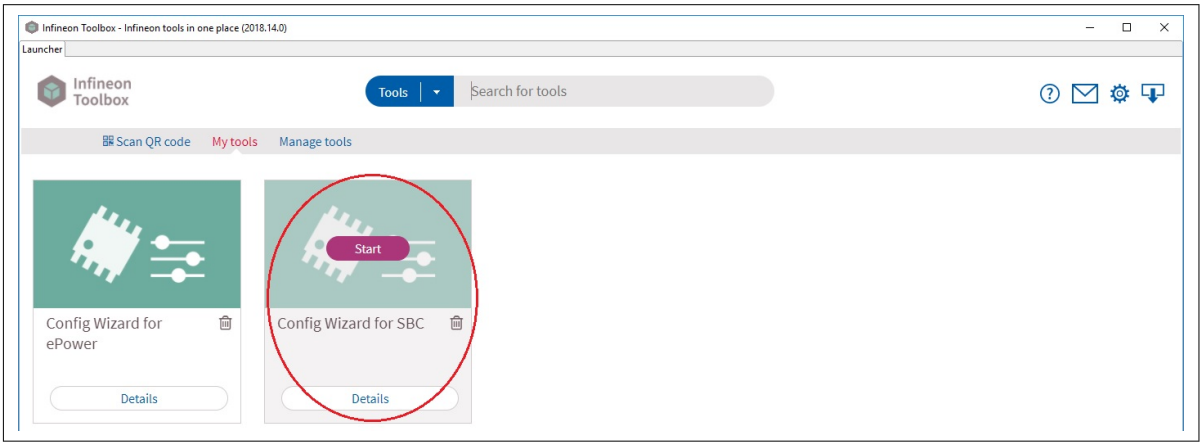

Figure 20 Config Wizard for SBC installed successfully

4. Click on "Start" and select the required chip.

6 Run-Time Control - Programming and Monitoring

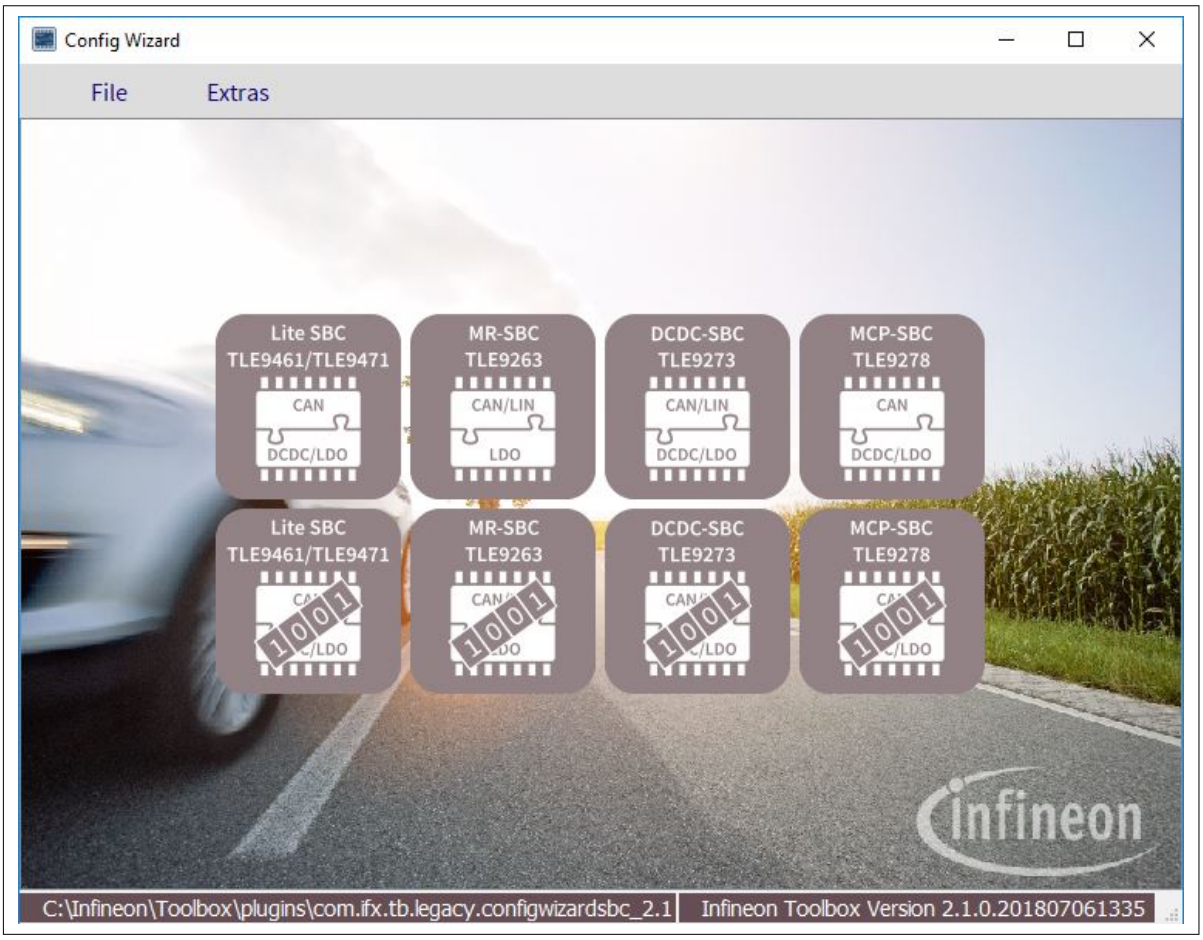

Figure 21 Chips for SBC in Config Wizard

For example, here with the TLE9278-3QX Evalboard correctly supplied, the following screen should display:

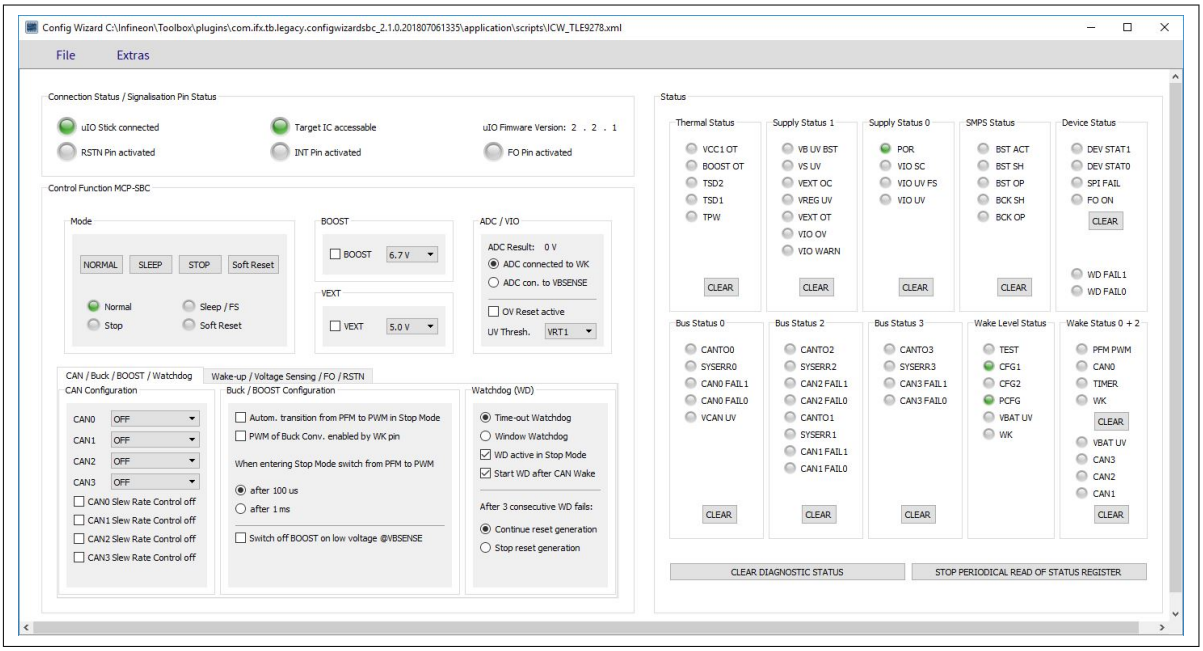

Figure 22 Config Wizard with SBC TLE9278

Warning: *Please ensure that the latest firmware is flashed onto the µIO-Stick. Otherwise, select the tab "Extra", then click "Update uIO...".*

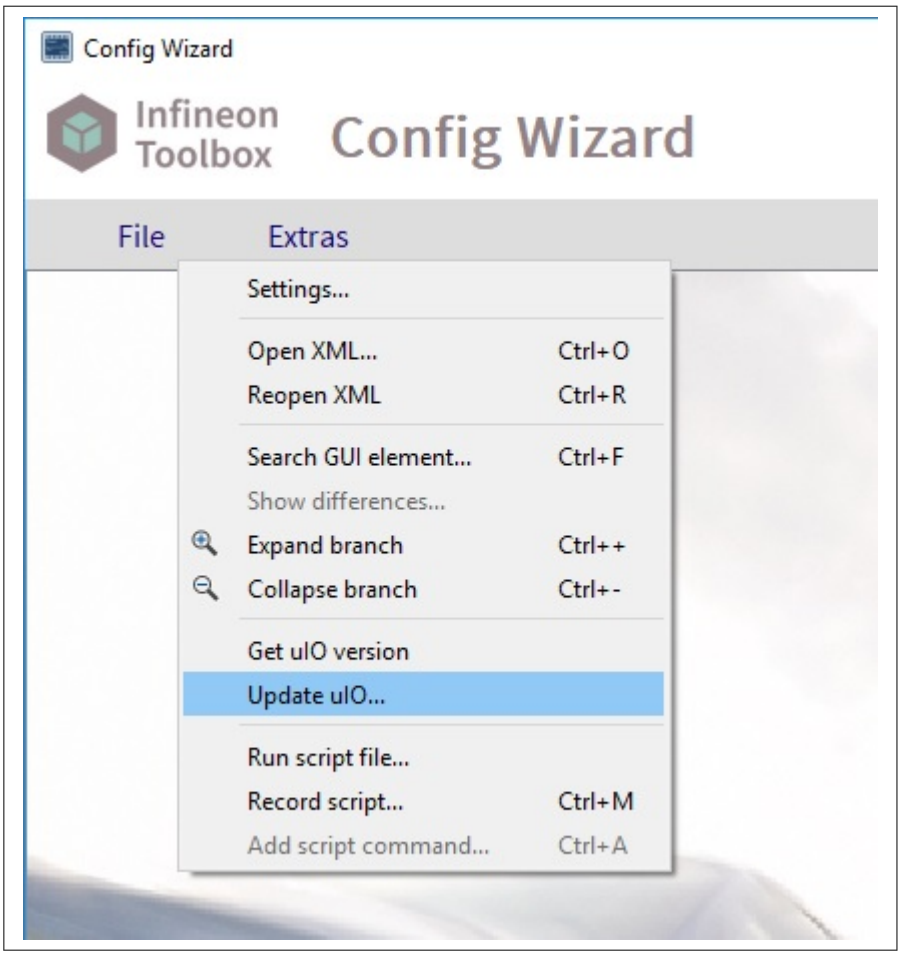

Figure 23 Select Extra > Update uIO...

Select the file "uIO_V221.hex" and click "OK".

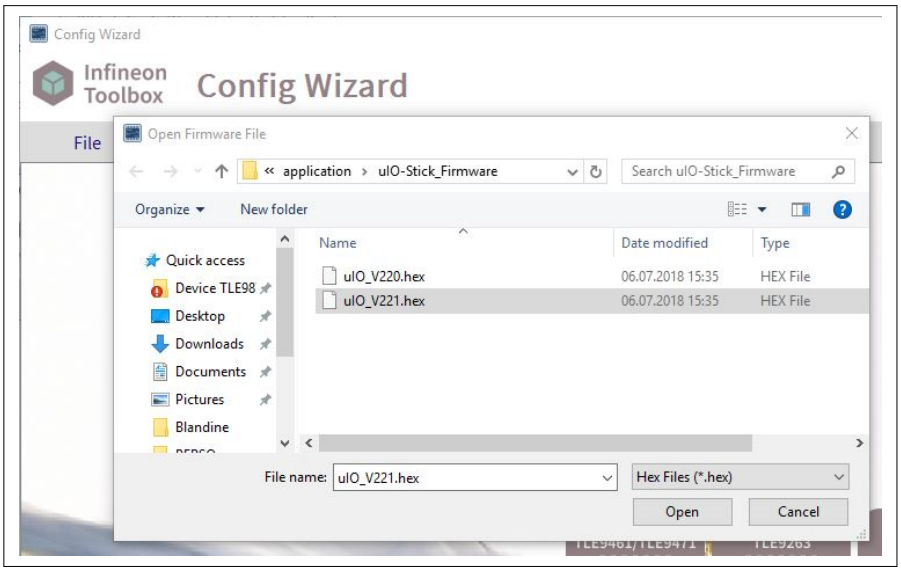

Figure 24 Select HEX file with the right version for µIO-Stick

When the update is completed, the µIO Firmware version should be 2.2.1.

6.2 Config Wizard

The Config Wizard is a Graphical User Interface which provides an easy access to SBC features and the SPI registers.

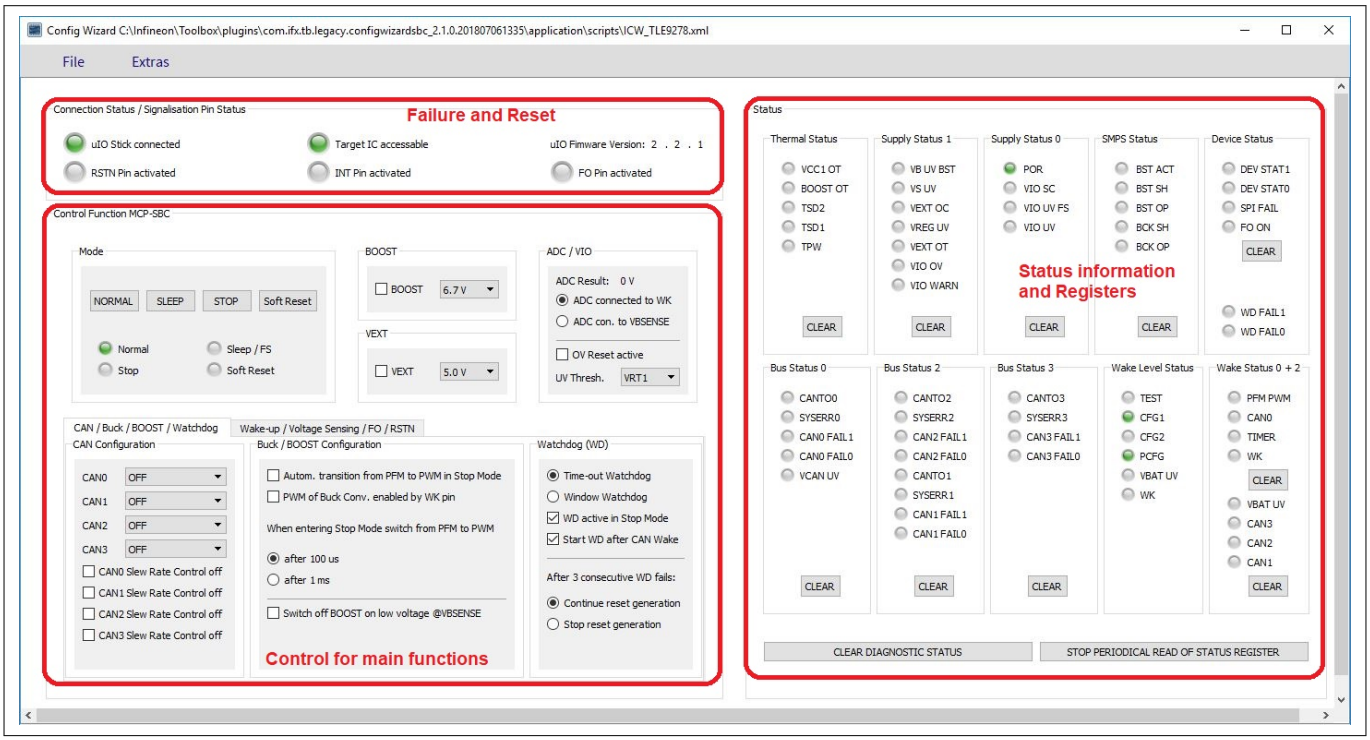

Figure 25 Config Wizard Graphical User Interface

6 Run-Time Control - Programming and Monitoring

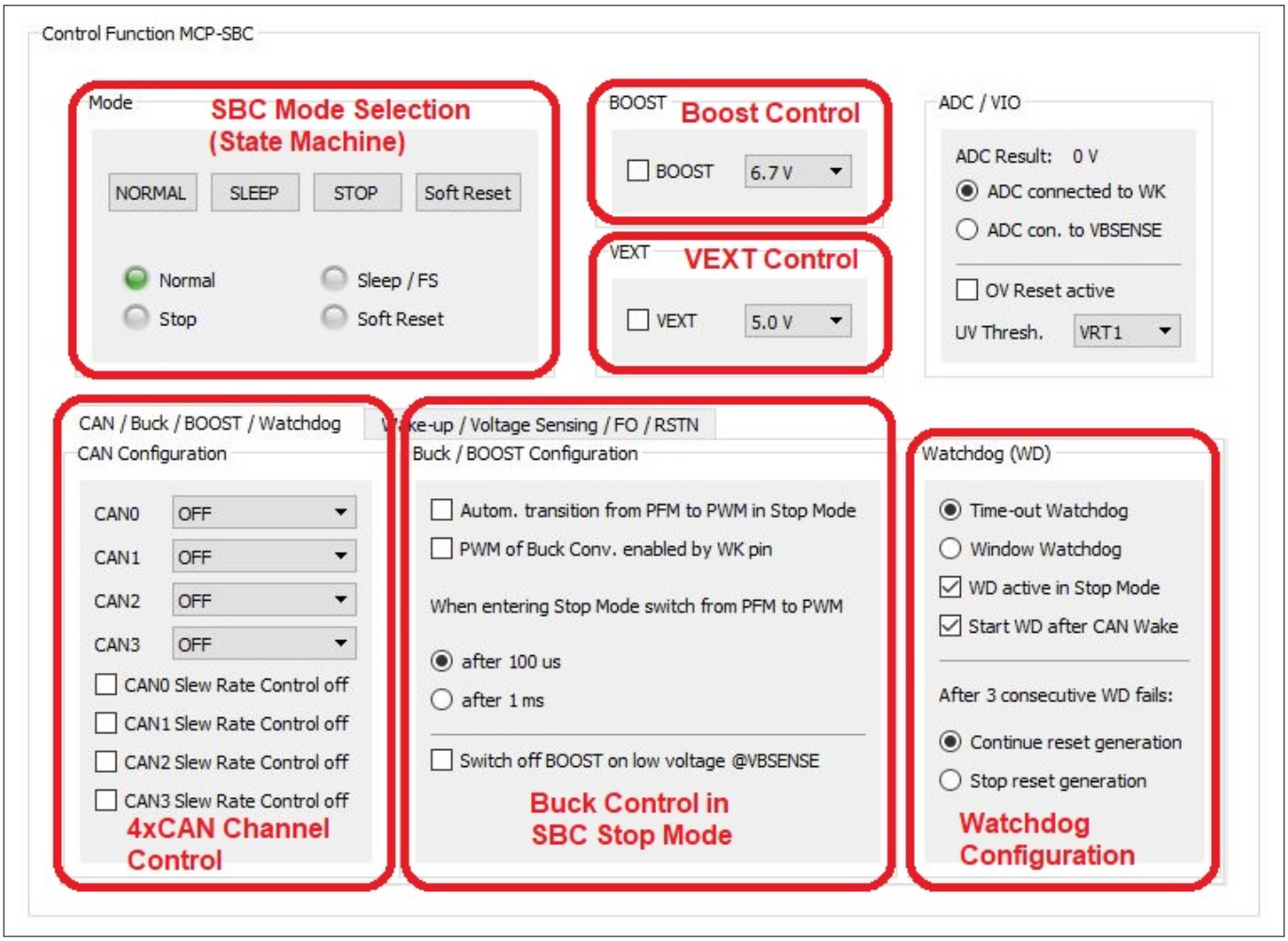

Figure 26 Config Wizard Control Functions

7 Updates and Purchases

For updates of the BSL tool software or the µIO-Stick firmware as well as for purchasing the µIO-Stick, please visit ***www.hitex.com/uio***.

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Edition 2018-09-18

Published by

Infineon Technologies AG

81726 Munich, Germany

Do you have a question about any aspect of this document?

Email: erratum@infineon.com

Document reference
IFX-wxj1535378137899

IMPORTANT NOTICE

The information contained in this application note is given as a hint for the implementation of the product only and shall in no event be regarded as a description or warranty of a certain functionality, condition or quality of the product. Before implementation of the product, the recipient of this application note must verify any function and other technical information given herein in the real application. Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind (including without limitation warranties of non-infringement of intellectual property rights of any third party) with respect to any and all information given in this application note.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Interface Development Tools ***category:***

Click to view products by Infineon ***manufacturer:***

Other Similar products are found below :

ADP5585CP-EVALZ CHA2066-99F AS8650-DB 416100120-3 XR18910ILEVB XR21B1421IL28-0A-EVB TW-DONGLE-USB EVAL-ADM2491EEBZ MAXREFDES23DB# MAX13235EEVKIT DFR0257 XR22404CG28EVB ZLR964122L ZLR88822L EVK-U23-01S EVK-W262U-00 DC327A PIM511 PIM536 PIM517 DEV-17512 STR-FUSB3307MPX-PPS-GEVK ZSSC3240KIT MAX9121EVKIT PIM532 ZSC31010KITV2P1 UMFT4233HPEV LVDS-18B-EVK MIKROE-2335 XR20M1172G28-0B-EB SI871XSOIC8-KIT 1764 1833 1862 EVB-USB82514 ATA6628-EK ATA6631-EK EVAL-CN0313-SDPZ 2264 MCP23X17EV PS081-EVA-HR MODULE 237 SMA2RJ45EVK/NOPB FR12-0002 MAFR-000455-001 BOB-13263 ORG4572-R01-UAR CPC5622-EVAL-600R SI871XSDIP6-KIT SKYFR-000743